NATURAL RESOURCES CONSERVATION SERVICE

CONSERVATION PRACTICE STANDARD

FORAGE HARVEST MANAGEMENT

(Acre)

CODE 511

DEFINITION

The timely cutting and removal of forages from the field as hay, green-chop or ensilage

PURPOSES

- Optimize the economic yield of forage at the desired quality and quantity
- Promote vigorous plant regrowth
- Maintain stand life for the desired time period
- Maintain desired species composition of the stand
- Use forage plant biomass as a nutrient uptake tool
- Control insects, diseases and weeds
- Maintain and/or improve wildlife habitat

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all land uses where machine harvested forage crops are grown.

CRITERIA

General Criteria Applicable to All Purposes

Harvest forage at a frequency and height that will maintain a desired healthy plant community through its life expectancy.

All fertilizer applications shall be made according to a nutrient management plan that is consistent with the Colorado 590 Standard.

All pesticide applications shall be made according to a pest management plan that is consistent with the Colorado 595 Standard.

Stage of Maturity
Harvest forage at the stage of maturity that provides the desired quality and quantity.

Delay harvest if prolonged or heavy precipitation is forecast that would seriously damage cut forage.

Where weather conditions make it difficult to harvest the desired quality of forage, use mechanical or chemical conditioners and/or ensile.

Adequate regrowth prior to the first killing frost will insure adequate food storage for spring growth and prevent winter injury.

Moisture Content
Harvest silage/haylage crops at the ideal moisture range for the type of storage structure(s) being utilized.

Treat direct cut hay crop silage (moisture content > 70%) with chemical preservatives or add dry feed stuffs to avoid fermentation and seepage digestible dry matter losses.

For optimal forage quality, rake, ted, or invert swaths and bale when hay has sufficient moisture to prevent leaf loss.

Bale at optimum moisture levels to preserve forage quality and quantity. Approximate percent moisture should be as follows:

- Bale field cured hay at 15 to 20 percent moisture.
- Bale forced air dried hay at 20 to 35 percent moisture.
- Rake hay at 30 to 40 percent moisture.
- Ted or invert swaths when moisture is above 40 percent.

Length of cut
When harvested for ensilage, forage will be chopped to a size that allows adequate packing to produce the anaerobic conditions necessary to ensure the proper ensiling process.

Contaminants
Forage shall not contain contaminants at levels injurious to the health of the livestock class and type being fed.

Contaminants are any objectionable matter or toxin that can cause illness, death or rejection of the offered forage.

Additional Criteria to Improve or Maintain Stand Life, Plant Vigor and Forage Species Mix

Stage of Maturity and Harvest Interval
Cut forage plants at a stage of maturity or harvest interval range that will provide adequate food reserves and/or basal or auxiliary tillers or buds for regrowth and/or reproduction to occur without loss of plant vigor.

Harvest management is the primary method by which managers can influence the nutritional quality of forage as well as forage yield and stand life. For alfalfa, total yields will continue to increase past the bud stage, however, crude protein and total digestible nutrients decline rapidly and most of the additional biomass is stem material. Carbohydrate content of roots continues to increase up until about full bloom, allowing the plant to regrow following harvest. Managers need to be aware of stand longevity versus forage digestibility, and balance their animal feed needs with crop rotation.

Cut reseeding annuals at a stage of maturity and frequency that ensures the production of viable seed or ample carryover of hard seed to maintain desired stand density.

If plants show signs of short-term environmental stress, management will be applied in a manner that ensures continued health and vigor of stand.

Stubble Height
Cut forage plants at a height that will promote the vigor and health of the desired species. Cutting heights will provide adequate residual leaf area; adequate numbers of terminal, basal, or auxiliary tillers or buds; insulation from extreme heat or cold; and/or unsevered stem bases that store food reserves needed for full, vigorous recovery.

Manipulate timing and cutting heights of harvest to ensure germination and establishment of reseeding or seeded annuals.

Refer to the Cutting Height Table in the Plans and Specifications section of this standard for recommended cutting heights.

Additional Criteria to Use as a Nutrient Uptake Tool

Employ a harvest regime that utilizes the maximum amount of available or targeted nutrients.

Additional Criteria to Control Disease, Insect and Weed Infestations

If a foliar disease, insects, or weeds threaten stand survival or production objective, schedule harvest periods as needed to control disease, insect, and weed infestations.

Lessen incidence of disease, insect damage, and weed infestation by managing for desirable plant vigor.

Additional Criteria to Improve Wildlife Habitat Values

Maintain appropriate harvest schedule(s), cover patterns and plant height to provide suitable habitat for the desired specie(s).

Avoid harvest and other disturbances during nesting, fawning and other critical times. Refer to the Upland Wildlife Habitat Management (645) or Wetland Wildlife Habitat Management (644), Conservation Practice Standards.

CONSIDERATIONS

Continuous cutting at an immature growth stage will cause the stand to deteriorate prematurely by decreasing food reserves in the roots.

When pastures produce forage in excess of livestock demand during high growth rate periods, consider preserving forage quality by machine harvesting a portion of the standing crop.

Well-fertilized plants withstand more intense harvest schedules and may produce a higher quantity and quality of forage.

To minimize disease, insect and weed pressure, clean harvesting equipment between fields, after harvest and before storing.

Do not cut forages until dew, rain or irrigation water on leaves has evaporated.

Take care not to produce stored forages whose quality is not that needed for optimum performance of the animal being fed. For example, immature legume forages can be too low in fiber and lead to metabolic disorders in ruminants and an economic loss to the producer due to lowered animal performance.

Direct cut grass and legume silage can create silage leachate (seepage). Consider the collection, storage and disposal of this leachate as part of an agricultural waste management system.

In conjunction with harvest options, explore storage and feeding options that will retain acceptable forage quality and minimize digestible dry matter loss.

In regions where rainfall and/or humidity levels cause unacceptable forage quality losses in at least one harvest during the year, consider ensiling the forage to reduce or eliminate field drying time. Other options are: the use of desiccants, preservatives, conditioners, macerating implements, or barn curing techniques to reduce field drying time, greenchopping or grazing. These techniques can improve the timeliness of harvest and preserve forage quality.

To decrease safety hazard, avoid operating harvesting and hauling equipment on field slopes over 25 percent, particularly on cross slope traffic patterns.

Avoid harvesting forage when soil moisture conditions are such that soil compaction becomes detrimental to plant and soil health.

PLANS AND SPECIFICATIONS

Specifications for Forage Harvest Management shall be prepared for each field or management unit according to the Criteria, Considerations and Operations and Maintenance sections of this standard. Specifications shall describe the requirements for applying this practice to meet the intended purpose.

Specifications shall be recorded on approved specification sheets, job sheets, narrative statements in the conservation plan or other acceptable documentation.

Cutting Heights

Species	Growth Stage	Minimum Cutting Height
Alfalfa	Early Bloom	2”
Grass/Legume	Boot/Early Bloom	3”
Tall Grass	Boot	6”
Mid Grass	Boot	3”

Time the last cutting to allow a two to four week re-growth period before the average first killing frost.

OPERATION AND MAINTENANCE

Before forage harvest, clear fields of debris that could damage machinery, or if ingested by livestock, lead to sickness (for example, hardware disease) or death.

Monitor weather conditions and take action accordingly before and after cutting to optimize forage wilting or curing time to preserve feed quality and prevent forage swaths or windrows from smothering underlying plants.

Inspect and repair harvesting equipment following manufacturer’s preventative maintenance procedures.

All shields shall be in place during machine operation to prevent injury or death. Shut off machinery before working on or unplugging moving parts.

Select equipment sizes and capacities that will handle the acreage normally harvested in a timely and economically feasible manner.

Operate all forage harvesting equipment at the optimum settings and speeds to minimize loss of leaves.

Set shear-plate on forage chopper to the proper theoretical cut for the crop being harvested. Keep knives well sharpened. Do not use recutters or screens unless forage moisture levels fall below recommended levels for optimum chopping action.

Regardless of silage/haylage storage method, ensure good compaction and an air-tight seal to exclude oxygen and mold formation.

REFERENCES:

Ball, D. M., C. S. Hoveland, & G. D. Lacefield. Southern Forages. 1991. Potash & Phosphate Institute, Norcross, GA.

Barnes, R. F., D. A. Miller, & C. J. Nelson. Forages, The Science of Grassland Agriculture, Fifth Edition. 1995. Iowa State University Press, Ames, IA.

Colorado Field Office Technical Guide, Section IV. Nutrient Management Conservation Practice Standard, Code 590. 2003. USDA, Natural Resources Conservation Service. Lakewood, CO.

Colorado Field Office Technical Guide, Section IV. Pest Management Conservation Practice Standard, Code 595. 2003. USDA, Natural Resources Conservation Service. Lakewood, CO.

Colorado Field Office Technical Guide, Section I. Agronomy Technical Note No. 78. 2000. Nutrient Management Planning Guidelines. USDA, Natural Resources Conservation Service. Lakewood, CO.

Hanson, A. A., D. K. Barnes, & R. R. Hill, Jr. Alfalfa and Alfalfa Improvement. 1988. American Society of Agronomy, Madison, WI.

Ishler, V. A. Et al. Harvesting and Utilizing Silage. 1991. Penn State University Circular 396. University Park, PA.

Matches, A. G. Anti-Quality Components of Forages. 1973. Crop Science Society of America Special Pub. No. 4, Madison, WI

Pitt, R. E. Silage and Hay Preservation. 1990. Northeast Regional Agricultural Engineering Service. Ithaca, NY.

Serotkin, N., Ed. The Penn State Agronomy Guide, 1995-1996. Pennsylvania State University. 1994. University Park, PA.

Smith, D. Forage Management in the North, Third Edition. 1975. Kendall/Hunt Publishing Company, Dubuque, IA.

Taylor, N. L. Clover Science and Technology. 1985. American Society of Agronomy, Madison, WI.